Citation:

Stookey JD, Constant F, Gardner CD, Popkin BM. Replacing sweetened caloric beverages with drinking water is associated with lower energy intake. *Obesity (Silver Spring)*. 2007 Dec;15(12):3013-22.

PubMed ID: 18198310

Study Design:

Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To evaluate drinking water as an alternative to sweetened caloric beverages, and to test for relationships between replacing sweetened caloric beverages with drinking water on change in total energy intake.

Inclusion Criteria:

- Participants from the Stanford A to Z intervention
- Premenopausal overweight women aged 25 - 50 years
- BMI of 27 - 40
- Willingness to accept random diet assignment
- Stable weight over the past 2 months while not actively on a weight loss program
- Plans to live in the area over the next year
- Available to participate in the required evaluations and interventions
- Adequate English speaking, reading and writing skills to complete questionnaires and read the weekly book class assignments
- Stable use of medications taken for at least 3 months

Exclusion Criteria:

- Self-reported uncontrolled hypertension, type 1 or 2 diabetes, heart, renal or liver disease, cancer or active neoplasms, uncontrolled hyperthyroidism
- Use of medications known to affect weight/energy expenditure
- Alcohol intake of 3 or more drinks/day
- Psychiatric care
- Women who were postmenopausal (including surgical menopause), pregnant, lactating, or planning to become pregnant over the next year
- self-reported poor general health

- implausibly low 3-day mean energy intake (<500 kcal/d)

Description of Study Protocol:

Recruitment

- Participants of the Stanford A to Z study, a clinical weight loss trial that randomized overweight premenopausal women to four popular weight loss diets.
- Study participants were recruited primarily from newspaper advertisements published in local newspapers

Design: Cohort study, secondary analysis of pooled randomized controlled trial data

Blinding used (if applicable): not applicable

Intervention (if applicable)

- Participants were asked to follow specific dietary guidelines but free to choose their own foods and beverages under naturalistic conditions
- One registered dietitian taught all four diet classes and study participants attended 8 classes, once per week, to discuss 1/8 of the assigned diet book
- Dr. Atkins' New Diet Revolution
- The Zone: A Dietary Roadmap
- The LEARN Program for Weight Management 2000
- Eat More, Weigh Less by Dr. Dean Ornish

Statistical Analysis

- Multivariable models were used to evaluate drinking water, non-caloric beverages, and nutritious caloric beverages as alternatives to sweetened caloric beverage intake

Data Collection Summary:

Timing of Measurements

- At baseline and 2, 6 and 12 months. After 2 months of classes, participants were followed for 10 months.
- Dietary intake and body composition were recorded before randomization, after the 2 months of diet classes, and 6 and 12 months after randomization

Dependent Variables

- Food composition (macronutrient, water and fiber content) and total energy intake estimated through three 24-hour diet recalls

Independent Variables

- Mean daily beverage intake (sweetened caloric beverages, drinking water, non-caloric diet beverages, and nutritious caloric beverages)
- Beverage intake expressed in relative terms (percentage of beverages)

Control Variables

- Physical activity assessed using the Stanford Seven-Day Physical Activity Recall
- Total beverage intake
- Non-caloric and nutritious caloric beverage intake
- Food composition
- Energy expenditure

Description of Actual Data Sample:

Initial N: 311 overweight women met all selection criteria

Attrition (final N):

- 131 reported regular intake of sweetened caloric beverages
- 121 attended the diet classes
- Data were available for 118 women at the 2-month follow-up, 110 women at the 6-month follow-up, and 96 women at the 12-month follow-up

Age: aged 25 - 50 years

Ethnicity: not described

Other relevant demographics:

Anthropometrics: BMI of 27 to 40

Location: California

Summary of Results:

Key Findings

- At baseline, sweetened caloric beverage and water intake did not differ by diet group
- Intake of non-caloric beverages did not differ significantly by diet group at any time point, so the diet groups were combined
- Over the 2 months of diet classes, sweetened caloric beverage intake was halved, and at the 2-month follow-up, 27% of the sample reported no intake of sweetened caloric beverages
- Over the 2 months of diet classes, intake of drinking water increased as a proportion of beverages by an average of 18 ± 24%
- Over the 2 months of diet classes, energy intake decreased for 87% of subjects
- On average, total energy decreased by 526 ± 544 kcal/day
- In fixed effects models that controlled for total beverage intake, non-caloric and nutritious caloric beverage intake (percentage of beverages), food composition and energy expenditure, replacing sweetened caloric beverages with drinking water was associated with significant decreases in total energy intake that were sustained over time
- The caloric deficit attributable to replacing sweetened caloric beverages with water was not negated by compensatory increases in other food or beverages
- Replacing all sweetened caloric beverages with drinking water was associated with a predicted mean decrease in total energy of 200 kcal/day over 12 months

Author Conclusion:

The results suggest that replacing sweetened caloric beverages with drinking water can help lower total energy intake in overweight consumers of sweetened caloric beverages motivated to diet.

Reviewer Comments:

High dropout rates and sample of women not well described; unclear if groups were similar.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	???
3.	**Were study groups comparable?**	Yes

3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	???
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	???
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A

6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	Yes
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	Yes
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes

	8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
	8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
	8.6.	Was clinical significance as well as statistical significance reported?	Yes
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		???
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	No
10.	**Is bias due to study's funding or sponsorship unlikely?**		???
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	???